

AN INTERESTING NEW GALL-FORMING *OPHIOMYIA* SPECIES  
(DIPTERA: AGROMYZIDAE) ON *ATRIPLEX*  
(CHENOPODIACEAE) IN SOUTHERN CALIFORNIA

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*Abstract.*—*Ophiomyia atriplicis* new species (Diptera: Agromyzidae), which forms bud galls on *Atriplex polycarpa* (Chenopodiaceae), is described. The male genitalia are illustrated and an account is given of the fly's biology.

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*Ophiomyia* is a relatively large, cosmopolitan genus of agromyzid flies, with over 150 described species. Twenty five species are now known from California (Spencer, 1981). The majority of species form stem mines, although a few mine leaves or feed on seeds. Several species are pests of economically important plants.

Ecological studies by one of us (BAH) on the galls of *Atriplex* spp. have revealed an undescribed species of *Ophiomyia* forming bud galls on *A. polycarpa* (Torrey) Watson. In this paper the species is described and data are provided illustrating its development and the structure of its gall.

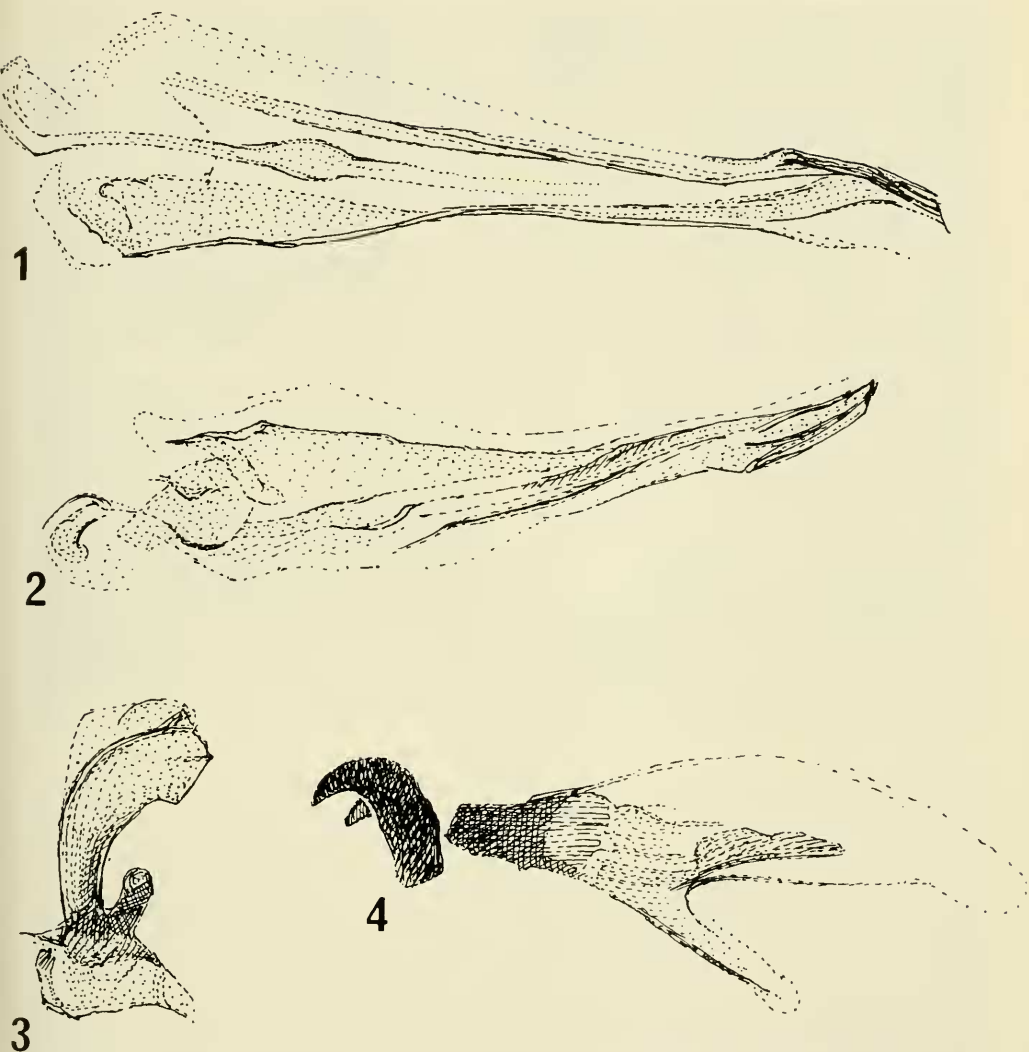
*Atriplex polycarpa* is a woody, perennial shrub ca. 1 m tall that is widespread in the deserts of western North America. It is a component of several desert plant communities, e.g., Creosote Bush Scrub, Shadscale Scrub and Sagebrush Scrub, and is an indicator species of the Alkali Sink Scrub Community in which it is usually the dominant perennial (Munz and Keck, 1959).

*Ophiomyia atriplicis* Spencer, NEW SPECIES

Figs. 1-4

Head.—Frons broad, from 2 to almost 3 × eye width, distinctly projecting above eye in profile; orbital bristles conspicuously slender, somewhat irregular both in number and inclination, both upper and lower orbitals normally inclined and slightly reclinate, more rarely more proclinate, varying from 2 to 3 upper and 2 to 3 lower; orbital setulae numerous, arranged irregularly in 2 rows, all reclinate; orbits well differentiated from frons, slightly broader above and narrowing towards base of antennae; ocellar triangle varying from moderately to brilliantly shining, broad above but extending narrowly to level between lower orbitals; gena deepest in center below eye; 3rd antennal segment small, rounded, arista swollen at base, then finely tapering, only minutely pubescent, appearing bare; base of antenna divided by narrow raised keel, without any central furrow; vibrissal margin with up to 12 short bristles in both sexes, no trace of vibrissal fasciculus in male; inner and outer vertical bristles widely diverging, low; post ocellars distinctly proclinate.

Legs.—No bristles on mid- or fore-tibiae.



Figs. 1-4. *Ophiomyia atriplicis*. 1, Aedeagus, dorsal aspect. 2, Aedeagus, lateral aspect. 3, Sperm pump, drawn from paratype from Torres Martinez Ind. Res. 4, Larval cephalopharyngeal skeleton.

Wing.—Length from 1.8 to 2.0 mm, female normally larger; C extending to apex of vein  $M_{1+2}$ ; last section of  $M_{3+4}$  generally slightly longer than penultimate but varying from 1.06 to 1.50 $\times$ .

Color.—Generally black; frons mat, contrasting with the orbits which are more shining adjoining eye margin and narrowly paler, almost brownish, towards frons; cheeks shining black, gena brownish black; scutum weakly shining black, abdomen more shining, with no trace of metallic coloration; wings pale, whitish, veins pale brown; squamae and fringe white, margin scarcely differentiated, at most pale brown; halteres black.

Male genitalia.—Aedeagus (Figs. 1, 2) with very long basal sclerites which extend beyond base of distiphallus, this in the form of a single weakly sclerotized ventrally

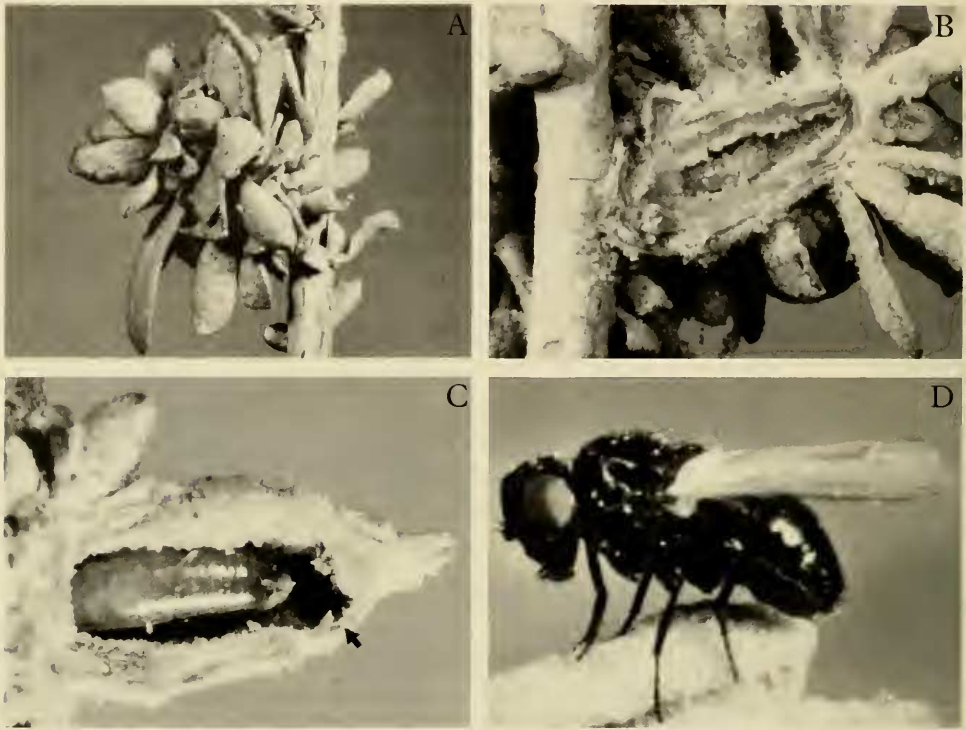


Fig. 5. *Ophiomyia atriplicis* and its gall. (A), Gall. (B), Larva in central feeding chamber. (C), A pupa (Leaves have been removed to show gall shape. Adult will emerge through the pre-formed emergence window (arrow)). (D), Adult male.

directed tubule; hypandrium elongate, side-arms narrow, with slightly extended apodeme; sperm pump minute, with asymmetrical blade (Fig. 3).

Larva.—Length up to 3.4 mm, white, segment boundaries little differentiated; mouth hooks with 2 strong teeth, the upper larger (Fig. 4); anterior spiracles on short projections, each with an ellipse of minute pores, anal segment blunt, extending beyond spiracles, these each with an ellipse of normally 3 pores; puparium pale brown.

Holotype.—Male, California, Riverside Co., Mecca, 14/II/1983, B. A. Hawkins. Paratypes: Mecca, 3 ♂, 2 ♀, 14/III/1982; California, Riverside Co., Torres Martinez Ind. Res., 3 ♂, 1 ♀, 30/III/1982. All material collected and reared from bud galls on *Atriplex polycarpa* by B. A. Hawkins. Holotype and paratypes deposited in the National Museum of Natural History, Washington, D.C.

#### BIOLOGY

Fig. 5 pictures the development of *O. atriplicis*. The mature gall is ca. 6 mm long and is covered with and hidden by a dense cluster of slightly elongated leaves (Fig. 5A). The leaves of *A. polycarpa* are clustered on axillary buds along the stems, and the adult female inserts a single egg into the stem at the base of a bud. Following eclosion the first instar occupies a small chamber formed in the stem beneath a bud until gall development begins. As the gall develops into its characteristic cone shape, the larva moves into the gall where it feeds and develops

in an elongate, central chamber which it excavates with its mouth hooks (Fig. 5B). As larval development proceeds, the gall changes from green and succulent to brown and woody. Prior to pupariation the mature larva scrapes a window near the distal end of the gall wall (Fig. 5C). Pupariation occurs in the gall (Fig. 5C) with the head oriented distally. The adult (Fig. 5D) emerges from the puparium and leaves the gall through the pre-formed emergence window. The leaves on empty galls gradually die and turn brown. These empty galls may persist for several months, but are no longer present by the following season.

Gall development may be initiated anytime from late fall to early spring. In 1980 and 1982, galls first appeared in early January, from which all adult flies had emerged by late March. Simultaneous with adult emergence from the first generation a second generation of galls appeared, the adults from which emerged in May. During the following season, however, galls were first observed in November, 1982, resulting in 3 generations in the 1982–1983 season rather than the 2 generations observed the previous years.

It is not known how or where *O. atriplicis* diapauses. Old galls do not support larvae or pupae over the summer, and no galls have been found on other plant species sympatric with *A. polycarpa*. It is assumed that diapause occurs as eggs or first instars implanted in stem tissue at the base of buds, similar to that found by Silverman and Goeden (1980) with a gall-forming tephritid, *Procecidochares* n. sp., attacking *Ambrosia dumosa* (Gray) Payne (Asteraceae) in southern California.

#### DISCUSSION

This is the first known case of an *Ophiomyia* sp. forming bud galls. Only 2 other gall-forming species are known in the genus. *Ophiomyia fici* Spencer and Hill (1976) forms leaf galls on *Ficus microcarpa* L. (Moraceae) in Hong Kong, and a species which will be described shortly forms long stem mines with the formation of some gall tissue on *Abutilon theophrasti* Medic. (Malvaceae), known in the United States from Minnesota to Mississippi (Spencer and Steyskal, in press).

This new species lacks the male vibrissal fasciculus which was originally considered to be an essential generic character, but a number of such species are now known in the genus. The raised facial keel and especially the form of the posterior larval spiracles confirm the generic position in *Ophiomyia*. The male genitalia are unique within the genus, confirming the isolated position of this interesting species.

In all of the genera normally included in the subfamily Agromyzinae, the larval cephalopharyngeal skeleton bears a double upper arm, each arm being distinctly and separately sclerotized. The only other case in which the double upper arm is more generally sclerotized, thus giving the appearance of a single broad arm, is in *Melanagromyza paederiae* Sasakawa from Japan (Sasakawa, 1954).

*Ophiomyia atriplicis* can be included in the senior author's key to California *Ophiomyia* species (Spencer, 1981) by the addition of the following couplet:

couplet 3, first alternative, for 4 read 3A

3A(3) Squamae and fringe silvery white . . . . . *atriplicis* new species  
 – Squamae and fringe dark, brown or black . . . . . 4

## LITERATURE CITED

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## NOTE

Lectotype designation for *Rhamphomyia abdita*  
Coquillett (Diptera: Empididae)

In response to a request from Howard E. Evans, Colorado State University, for determination of a small series of an empidid fly, I was somewhat taken aback when the specimens arrived and they turned out to be a species of the huge genus *Rhamphomyia*. The latest comprehensive key to this genus is by Coquillett (1895, Proc. U.S. Natl. Mus. 18: 387-440). Surprisingly enough, determinations may frequently still be made with this key if synonymy, etc., are checked in the latest catalog (Stone, A. et al., eds., 1965, Agr. Handbook No. 276). Evans' specimens ran rather easily to *R. abdita* Coquillett (ibid, pp. 430), which is now cataloged as a synonym of *R. sociabilis* (Williston). Melander (1902, Trans. Am. Entomol. Soc. 28: 195) stated the synonymy of these 2 species, both of which are based on specimens of the same series taken by C. V. Piper at Pullman, Washington. Although Coquillett in his description of *R. abdita* cited one male and 3 females as "types" with USNM nos. 3223 and 3224, no type labels remain with specimens now in the USNM collection. There is, however, one male specimen from the original Piper lot in good condition bearing a determination label "Rhamphomyia abdita Coq." in Coquillett's handwriting. I have added thereunto a red label "Lectotype Rhamphomyia abdita Coq., G. Steyskal, 1984." Comparison of this specimen with numerous other Piper specimens determined as either *R. abdita* or *R. sociabilis* leaves no doubt that they are all of the same species first described as *Empis sociabilis* Williston. Complete references to descriptions, etc., may be found in Stone, A. et al., eds., 1965, A Catalog of the Diptera of America North of Mexico (reprinted by Smithsonian Press, 1983).

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